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(54) **SPORTING-GOOD IMPLEMENT WITH ROTATABLE HANDLE**

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USPC 473/457, 519, 520, 564–568
See application file for complete search history.

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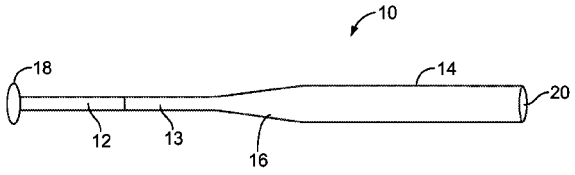
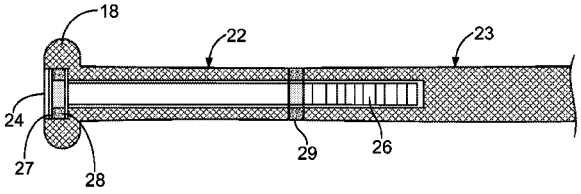
(57) **ABSTRACT**

A sporting-good implement, such as a ball bat or a lacrosse stick, includes a first handle section rotatably connected to a second handle section. The second handle section may be attached to or integral with a tapered region or barrel region of a ball bat, or with a shaft section or head of a lacrosse stick, or with another sporting-good feature. This rotatable engagement allows the relative position of the user's hands to change during the course of a swing, shot, or pass, ideally placing the user's hands in a position to generate improved power or control.

17 Claims, 4 Drawing Sheets





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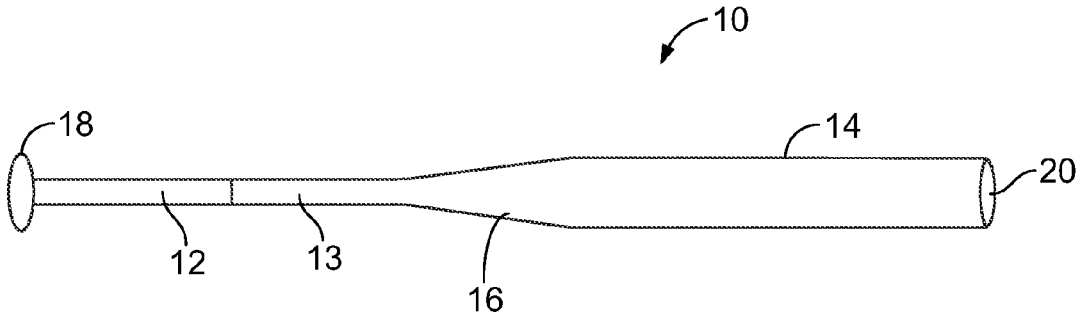

FIG. 1

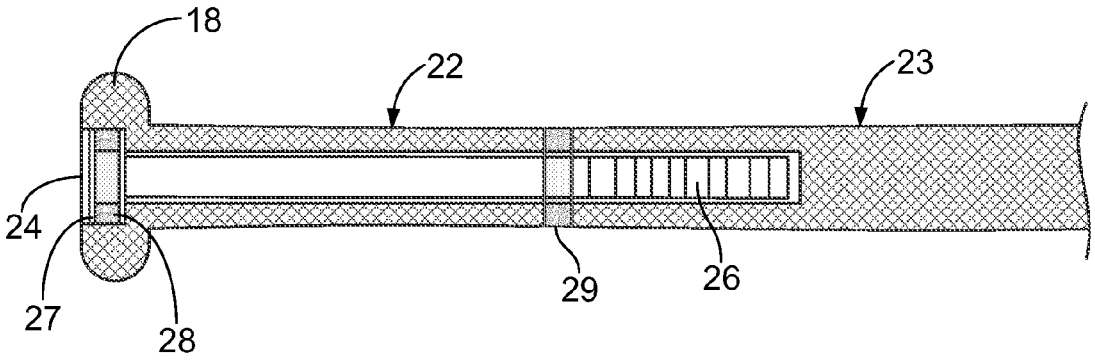

FIG. 2

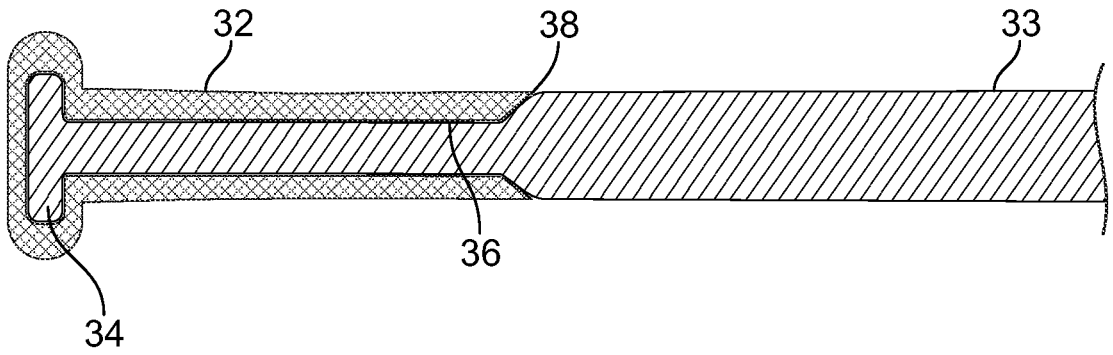

FIG. 3

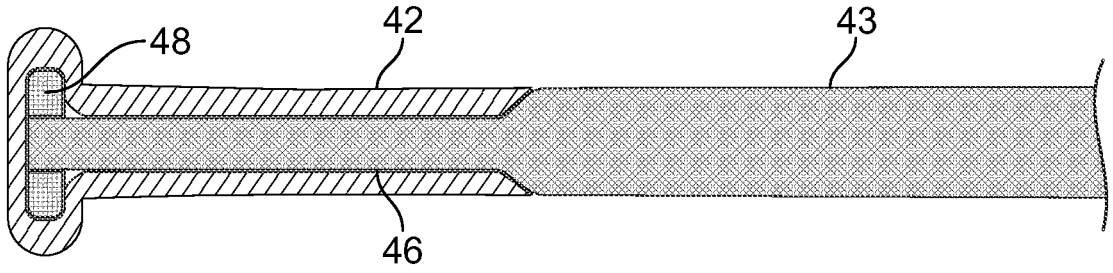

FIG. 4

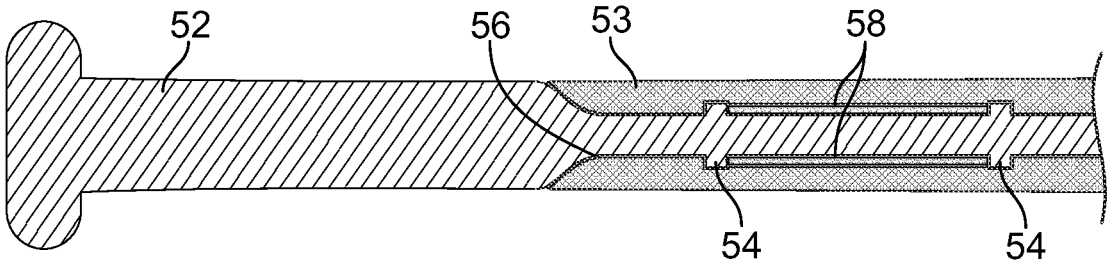

FIG. 5

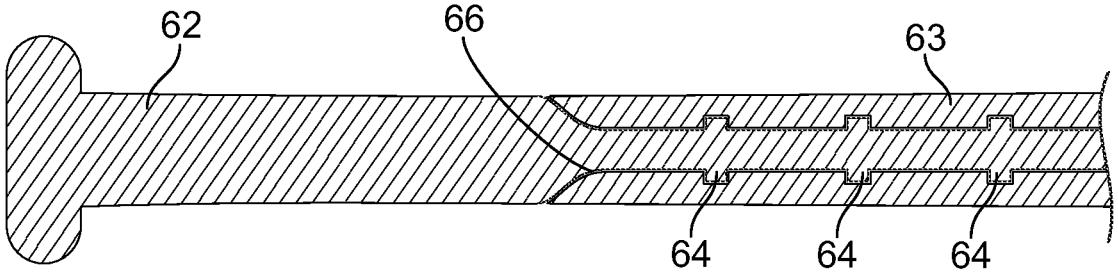

FIG. 6

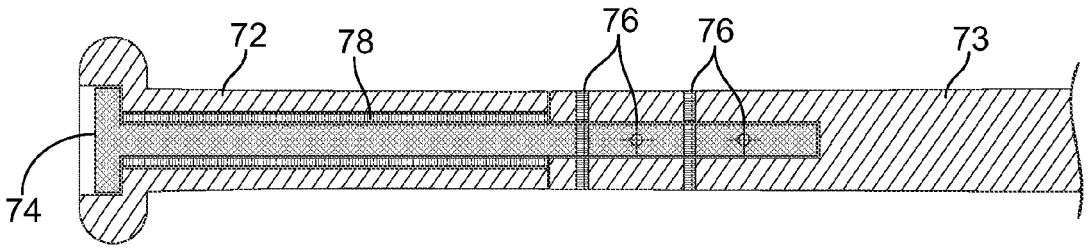

FIG. 7

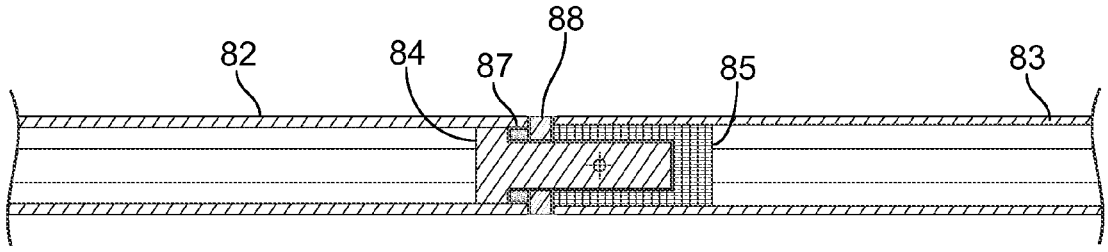

FIG. 8

SPORTING-GOOD IMPLEMENT WITH ROTATABLE HANDLE

BACKGROUND

Baseball and softball batters often experience fatigue in their forearms after swinging a bat several times over a short interval. A force analysis indicates that this fatigue at least partially results from the bottom hand and the top hand opposing each other during the swing. In general, the bottom hand generally performs a pulling motion while the top hand generally performs a pushing motion. During the initial stages of the swing, as the bottom hand pulls and the top hand pushes, the barrel of the bat begins to descend into the plane of the pitched (or stationary) ball. During this time, the hands ideally rotate into the proper "power position," in which the palm of the lower hand generally faces downward while the palm of the upper hand generally faces upward. There may be some variance due to differing pitch locations but, regardless, in the power position the two palms should generally face opposite directions while being essentially coplanar. To accomplish this hand-positioning, most batters need to rotate one or both of their hands during the swing.

SUMMARY

A sporting-good implement, such as a ball bat or a lacrosse stick, includes a first handle section rotatably connected to a second handle section. The second handle section may be attached to or integral with a tapered region or barrel region of a ball bat, or with a shaft section or head of a lacrosse stick, or with another sporting-good feature. This rotatable engagement allows the relative position of the user's hands to change during the course of a swing, shot, or pass, ideally placing the user's hands in a position to generate improved power or control. Other features and advantages will appear hereinafter. The features described above can be used separately or together, or in various combinations of one or more of them.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, wherein the same reference number indicates the same element throughout the views:

FIG. **1** is a perspective view of a ball bat including a rotatable handle, according to one embodiment.

FIG. **2** is a cross-sectional view of the rotatable handle region of a ball bat, according to one embodiment.

FIG. **3** is a cross-sectional view of the rotatable handle region of a ball bat, according to another embodiment.

FIG. **4** is a cross-sectional view of the rotatable handle region of a ball bat, according to another embodiment.

FIG. **5** is a cross-sectional view of the rotatable handle region of a ball bat, according to another embodiment.

FIG. **6** is a cross-sectional view of the rotatable handle region of a ball bat, according to another embodiment.

FIG. **7** is a cross-sectional view of the rotatable handle region of a ball bat, according to another embodiment.

FIG. **8** is a cross-sectional view of the rotatable handle region of a lacrosse shaft, according to one embodiment.

DETAILED DESCRIPTION OF THE DRAWINGS

Various embodiments of the invention will now be described. The following description provides specific details for a thorough understanding and enabling description of these embodiments. One skilled in the art will understand, however, that the invention may be practiced without many of these details. Additionally, some well-known structures or functions may not be shown or described in detail so as to avoid unnecessarily obscuring the relevant description of the various embodiments.

The terminology used in the description presented below is intended to be interpreted in its broadest reasonable manner, even though it is being used in conjunction with a detailed description of certain specific embodiments of the invention. Certain terms may even be emphasized below; however, any terminology intended to be interpreted in any restricted manner will be overtly and specifically defined as such in this detailed description section.

Where the context permits, singular or plural terms may also include the plural or singular term, respectively. Moreover, unless the word "or" is expressly limited to mean only a single item exclusive from the other items in a list of two or more items, then the use of "or" in such a list is to be interpreted as including (a) any single item in the list, (b) all of the items in the list, or (c) any combination of items in the list. Further, unless otherwise specified, terms such as "attached" or "connected" are intended to include integral connections, as well as connections between physically separate components.

While the concepts described herein may be utilized in a variety of sporting-good implements, such as ball bats, lacrosse sticks, and hockey sticks, for ease of description, a ball bat primarily will be described. Turning now in detail to the drawings, as shown in FIG. **1**, a baseball or softball bat **10**, hereinafter collectively referred to as a "ball bat" or "bat," includes a first handle section **12** rotatably engaged with a second handle section **13**. A grip made of rubber, tape, foam, or of another suitable material may be positioned over one or both of the first and second handle sections **12**, **13**. In one embodiment, separate grips are positioned on the first and second handle sections **12**, **13** so that they do not hinder relative rotation between the handle sections **12**, **13**.

A tapered section **16** of the bat **10** joins the second handle section **13** to a barrel **14**. A radially outer surface of the tapered section **16** preferably is flush and continuous with the radially outer surfaces of the second handle section **13** and the barrel **14**. The second handle section **13**, the tapered section **16**, and the barrel **14** may be integral or may include two or more separate pieces attached to each other, as described, for example, in U.S. Pat. No. 5,593,158, which is incorporated herein by reference.

The free end of the first handle section **12** includes a knob **18** or similar structure. The barrel **14** is preferably closed off by a suitable cap **20** or plug. The interior of the bat **10** is preferably substantially hollow, allowing the bat **10** to be relatively lightweight so that ball players may generate substantial bat speed when swinging the bat **10**.

The bat barrel **14** preferably is constructed from one or more metal, plastic, or composite materials that are co-cured during the barrel molding process. Some examples of suitable materials include aluminum, titanium, ABS plastic, carbon, glass, graphite, boron, aramid, ceramic, Kevlar, or Astroquartz®. The handle sections **12**, **13** may be constructed from the same material as, or different materials than, the barrel **14**. For example, the handle sections **12**, **13** may be constructed from a composite material, a plastic material, a metal material, or any other suitable material. Further, in some embodiments, the first handle section **12** may be made of a different material than the second handle section **13**.

The bat barrel **14** may include a single-wall or multi-wall construction. A multi-wall barrel may include, for example, barrel walls that are separated from one another by one or more interface shear control zones ("ISCZs"), as described in

detail in U.S. Pat. No. 7,115,054, which is incorporated herein by reference. An ISCZ may include, for example, a disbonding layer or other element, mechanism, or space suitable for preventing transfer of shear stresses between neighboring barrel walls. A disbonding layer or other ISCZ preferably further prevents neighboring barrel walls from bonding to each other during curing of, and throughout the life of, the ball bat **10**.

The ball bat **10** may have any suitable dimensions. The ball bat **10** may have an overall length of 20 to 40 inches, or 26 to 34 inches. The overall barrel diameter may be 2.0 to 3.0 inches, or 2.25 to 2.75 inches. Typical ball bats have diameters of 2.25, 2.625, or 2.75 inches. Bats having various combinations of these overall lengths and barrel diameters, or any other suitable dimensions, are contemplated herein. The specific preferred combination of bat dimensions is generally dictated by the user of the bat **10**, and may vary greatly between users.

The first handle section **12** of the ball bat **10** may be attached to the second handle section **13** in any manner that securely connects—and provides relative rotation between—the two handle sections. The first handle section **12** is generally intended to be gripped by a user's bottom or non-dominant hand, while the second handle section **13** is generally intended to be gripped by the user's upper or dominant hand. In one embodiment, the first handle section **12** extends approximately three to six inches from the knob **18**, and the second handle section **13** extends approximately three to ten inches from the first handle section **12**, or the second handle section **13** is integral with the tapered section **16** (if included) or the barrel **14**. Any other suitable handle-section lengths may alternatively be used. Examples of suitable connections between the first and second handle sections **12**, **13** in a ball bat **10** are shown in FIGS. **2-7** (with different reference numbers used to identify the handle sections to reflect the differences between the illustrated embodiments).

In the embodiment shown in FIG. **2**, the first handle section **22** is connected to the second handle section **23** via a bolt **24** or other threaded connector. The bolt **24** is inserted through a plate **27** or similar mounting structure at the lower end of the first handle section **22**. The external threads **26** of the bolt engage matching internal threads of the second handle section **23** to secure the first and second handle sections **12**, **13** to each other. The internal threads may be part of the second handle section **23** itself, or may be included in a separate insert, such as a threaded metal insert that is molded with—or otherwise affixed to—the radially inner surface of the second handle section **23**.

The bolt **24** passes through a first spacer or bearing member **28** positioned in or near the knob **18** of the ball bat **10**, and a second spacer or bearing member **29** positioned between the first and second handle sections **22**, **23**. The first and second bearing members **28**, **29** optionally include grooves or other bearing tracks along which the handle sections may rotate. This bearing arrangement provides full 360-degree rotation between the first and second handle sections **22**, **23**.

The first and second bearing members **28**, **29** may be made of a metal material, such as aluminum, or of a composite material, such as glass-reinforced polycarbonate, or of another suitable material. While two bearing members are shown in the illustrated embodiment, any other suitable number of bearing members—arranged to provide relative rotation between the first and second handle sections **22**, **23**—may be utilized. In one embodiment, for example, a single bearing member extending the length of the first handle section **22** may be used to facilitate rotation between the first and second handle sections **22**, **23**.

In the embodiment shown in FIG. **3**, the first handle section **32** is positioned over the second handle section **33**, including over the knob region **34** of the second handle section **33**. The knob region **34** prevents longitudinal slippage of the first handle section **32**. In one version of this embodiment, the first handle section **32** is made of a composite or plastic material, while the second handle section **33** is made of a composite or metal material.

The outer diameter of the portion of the second handle section **33** that resides within the first handle section **32** is reduced relative to the diameter of the portion of the second handle section **23** that extends away from the first handle section **22**. The outer diameter of this extending region of the second handle section **33** preferably is equal to, or substantially equal to, the outer diameter of the first handle section **32** so that the longitudinally neighboring outer surfaces of the first and second handle sections **32**, **33** are continuous and flush with each other.

A low-friction release ply **36**, such as a layer of polytetrafluoroethylene (Teflon®) or another ISCZ, is positioned between the first and second handle sections **32**, **33** to facilitate rotation between them. The release ply alternatively may be made of a higher-friction material if a greater resistance to rotation is desired. The release ply preferably has a thickness of approximately 0.002 to 0.010 inches. Any other suitable thickness may alternatively be utilized.

In one embodiment, the release ply **36** completely isolates the first and second handle sections **32** from each other such that they are free to rotate a full 360 degrees about the release ply **36**. In an alternative embodiment, the first and second handle sections **32**, **33** may be molded together as a unitary construction or may otherwise be connected or merged at a longitudinal interface region **38**, or at another suitable region, in a manner that allows for only limited relative rotation between them.

For example, one or more composite plies including fibers oriented at zero degrees relative to the longitudinal axis of the ball bat may be used to construct both the first and second handle sections **32**, **33** (or portions thereof). Plies oriented in this manner would act essentially as a composite torsion spring that facilitates a limited amount of rotation between the first and second handle sections **32**, **33** during a swinging motion, while "snapping" the bat back into its initial alignment after the swing is completed.

In the embodiment shown in FIG. **4**, a bearing **48** is included in addition to a release ply **46** to provide rotation between the first and second handle sections **42**, **43**. One or more additional bearings optionally may be included, as well. Depending on the materials used, including one or more bearings may facilitate less restricted rotation relative to a ball bat including only a release ply between the first and second handle sections.

In the embodiment shown in FIG. **5**, the first handle section **52** extends inside of the second handle section **53**. The first handle section **52** includes one or more radially outward projections **54** that engage an interior region of the second handle section **53** to prevent, or substantially prevent, the first handle section **52** from pulling out of the second handle section **53**. Two of these projections are included in the illustrated embodiment but any other suitable number may be used.

To attain this configuration, the first and second handle sections **52**, **53** are preferably made of composite materials or other moldable materials that may be laid up together and co-molded into a hardened configuration. One or more release plies **56**, bearings **58**, or both, are included between the first and second handle sections **52**, **53** to facilitate rota-

tion between them. In an alternative embodiment, the second handle section **53** may include one or more radially inward projections that engage an exterior region of the first handle section **52** to prevent, or substantially prevent, the first handle section **52** from pulling out of the second handle section **53**.

The embodiment shown in FIG. **6** is similar to the embodiment shown in FIG. **5** except that the bearing is omitted and a third radially outward projection **64** is included between the first and second handle sections **62**, **63**. A release ply **66** is included between the first and second handle sections **62**, **63** to facilitate rotation between them.

In the embodiment shown in FIG. **7**, a bolt **74** is inserted into the first handle section **72** and threaded into receiving threads in the second handle section **73**, similar to the configuration shown in FIG. **2**. One or more pins **76** (four pins are shown in the illustrated embodiment) may be used to provide additional strength to the connection between the bolt **74** and the second handle section **73**. The pins **76** pass through openings in the second handle section **73** and the bolt **74** to further secure them together. At least one bushing **78** is positioned between the bolt **74** and the first handle section **72** to provide rotation of the first handle section **72** around the bolt **74** (and, thus, relative rotation between the first and second handle sections **72**, **73**).

In another embodiment, the first handle section may include a portion with a reduced or tapered diameter that is inserted into the second handle section. Alternatively, the second handle section may have a portion with a reduced or tapered diameter that is inserted into the first handle section. Grooves or a similar bearing system, or one or more release plies, may be provided between the first and second handle sections to facilitate rotation up to 360 degrees between the two handle sections.

In another embodiment, the first handle section is connected to the second handle section via a rotatable sleeve. The sleeve may provide the only connection between the first and second handle sections, or one or more additional connection mechanisms may be used. The sleeve may be connected inside the first and second handle sections, or outside both of them, or inside one of them and outside the other. In one version of this embodiment, the sleeve may be made of a rubbery or otherwise elastic material that allows it to recoil to its original, pre-swing position after a swing.

In another embodiment, the torque rate required to induce rotational motion between the first and second handle sections may be adjustable to meet a given user's needs. The required torque may be adjusted by tightening or loosening a bolt that connects the two handle sections, for example, via an Allen wrench or other tool. The torque rate required to induce rotation may be adjusted so high that the first and second handle sections do not rotate at all during a typical swing, thus effectively deactivating the rotation feature. Conversely, the torque rate required to induce rotation may be adjusted so low that the first and second handle sections will rotate in response to minimal force.

In another embodiment, a torsion spring or rotary spring may be attached to or integrally molded with interior portions of the first and second handle sections to control the amount of rotation between them. While including a separate spring adds some weight to the bat, such a self-realigning feature also provides a degree of rotational resistance that is felt by the user. This resistance may provide useful feedback to the user regarding proper hand alignment. For example, if a user experiences an extreme amount of resistance, he or she may determine that it would be advantageous to alter the initial hand positions on the ball bat.

Various ranges of motion may be preferred by different types of hitters. For example, a "contact hitter," such as a typical leadoff hitter, may exhibit a controlled swing in which his or her hands rotate approximately 15-30° during a typical swing. More powerful hitters, conversely, may rotate their hands approximately 30-90° during a typical swing, or even 90-180° degrees during a particularly powerful swing. Providing rotating handle sections in the ball bat, such that the hitter's hands rotate along with, as opposed to relative to, the bat handle, facilitates the generation of increased hitting power in a shorter path to the ball than that generally produced by a conventional ball bat.

In use, a ball bat constructed according to the above embodiments facilitates a level swing that keeps the hitting surface of the bat in the hitting zone for an extended period of time. Because the bat itself rotates, the user's hands do not need to rotate relative to the bat, thus allowing the user's hands to exert increased force in a shorter path in the direction of the swing. Put another way, when the user's arms begin to extend toward the pitcher, the rotatable handle allows the user's hands to reach the power position without active effort from the user. Further, because the structural handle sections of the bat rotate relative to each other, there is no need for additional, less durable rotating mechanisms, such as rotatable grip members.

The margin of error for the timing of a swing at a pitched ball also may be increased due to inclusion of rotating handle sections. Indeed, the bat barrel generally is able to arrive in the plane of the pitch more quickly because the hitter's hands do not need to rotate around the handle. Thus, the barrel remains in the hitting plane for a longer period of time and faster bat speed may be generated. Further, fewer unintended ground balls may be hit because the user is able to keep the bat in the hitting zone longer without rolling over the hands, particularly when swinging at a low pitch or an off-speed pitch. In addition, the user can get the barrel of the bat into the hitting zone more quickly when swinging late on a difficult to hit inside pitch. Thus, the hitter is more likely to make solid contact on various pitches.

As noted above, the concepts described herein may be applied to other sporting-good implements, as well. The various rotatable handle features described above may be used, for example, in a lacrosse-stick shaft, a hockey-stick shaft, and so forth. Additional or alternative features may also be included in these types of items. For ease of description, a lacrosse-stick shaft will be described below with regard to these additional features.

In the embodiment shown in FIG. **8**, a first handle section or shaft section **82** of a lacrosse stick is connected to a second handle section or shaft section **83** of the lacrosse stick via a bolt **84** or other suitable connector. The bolt is inserted into the first shaft section **82** and threaded into receiving threads in the second handle section **83**. The receiving threads may be located in the interior surface of the second shaft section **83**, or a separate insert or receiving element **85** including internal threads, such as urethane potting or another suitable component, may be positioned within the second shaft section **83** for receiving the bolt **84**.

A bearing **88** or similar spacer is positioned between the first and second shaft sections **82**, **82** to provide rotation between them. A washer **87** or similar element may be included between the head of the bolt **84** and the bearing **88** to provide a secure connection and to prevent the bolt from damaging the bearing **88**.

In one embodiment, a quick-release mechanism—which allows a player to rotate the lacrosse-stick shaft between a ball-cradling position and a shooting position—may be

included in the lacrosse shaft. The quick-release mechanism may be operated via a button, switch, or similar actuator positioned on or in the shaft that facilitates relative rotation of the first and second handle sections when actuated.

In another embodiment, the first and second handle or shaft sections of the lacrosse-stick shaft may have differing external shapes, thus allowing a user to identify which section he or she is gripping without looking at the shaft. The first shaft section, for example, may have a circular or elliptical cross section, while the second shaft section may have an octagonal cross section. Any other suitable shapes or combinations of shapes may alternatively be used.

The first or lower shaft section in the lacrosse-stick shaft may have a variety of lengths, depending on the preferences of a given user. Thus, the connection point between the first and second shaft sections may be located near the bottom of the shaft away from the lacrosse head, or approximately at the midpoint of the shaft, or near the top of the shaft adjacent to the head, and so forth.

In one embodiment, the rotation-facilitating mechanism may also provide increased or varied shaft flexion, such as when an elastic connector is used to provide rotation. Additionally or alternatively, the lower and upper shaft sections may have differing stiffness properties or flexion profiles. In one version of this embodiment, the lower shaft section may be stiffer than the upper shaft section to provide enhanced performance or "whip" when shooting or passing a lacrosse ball.

Any of the above-described embodiments may be used alone or in combination with one another, and elements of certain embodiments may interchanged with those of other embodiments. For example, where applicable, bearings may be used in place of bushings, and vice versa, pins may be added or omitted, and so forth. Further, the sporting-good implements may include additional features not described herein. While several embodiments have been shown and described, various changes and substitutions may of course be made, without departing from the spirit and scope of the invention. The invention, therefore, should not be limited, except by the following claims and their equivalents.

What is claimed is:

1. A ball bat, comprising:

a first handle section having a first outer diameter;

a second handle section having a second outer diameter that is substantiallyequal to the first outer diameter, with the second handle section rotatably connected to the first handle section such that the first and second handle sections are freely rotatable relative to each other to allow relative rotation between the first handle section and the second handle section during a swinging motion;

a barrel; and

a tapered section joining the barrel to the second handle section, wherein a radially outer surface of the tapered section is flush and continuous with a radially outer surface of the second handle section and with a radially outer surface of the barrel.

2. The ball bat of claim **1** wherein the first handle section is connected to the second handle section via a threaded connector.

3. The ball bat of claim **1** wherein one of the first and second handle sections includes a knob, the ball bat further comprising a first bearing member positioned in the knob, and a second bearing member positioned between the first and second handle sections.

4. The ball bat of claim **1** wherein the second handle section includes a reduced-diameter region having a third outer diameter that is less than the second outer diameter, wherein the reduced-diameter region is positioned inside the first handle section.

5. The ball bat of claim **4** further comprising a release ply positioned between a radially inner surface of the first handle section and a radially outer surface of the reduced-diameter region, wherein the release ply facilitates rotation between the first and second handle sections.

6. The ball bat of claim **1** further comprising a grip positioned on at least one of the first and second handle sections.

7. The ball bat of claim **6** wherein a first grip is positioned on the first handle section and a second grip is positioned on the second handle section.

8. The ball bat of claim **1** wherein the first handle section is rotatably engaged with the second handle section via at least one bearing.

9. The ball bat of claim **1** wherein at least a portion of the first handle section is separated from at least a portion of the second handle section by at least one release ply.

10. The ball bat of claim **1** wherein the first handle section is rotatably engaged with the second handle section via at least one bearing, and at least a portion of the first handle section is separated from at least a portion of the second handle section by at least one release ply.

11. The ball bat of claim **1** wherein a portion of the first handle section is positioned inside of the second handle section, and wherein the portion of the first handle section includes at least one radially outward projection that engages an interior region of the second handle section to substantially inhibit longitudinal movement of the first handle section relative to the second handle section.

12. The ball bat of claim **1** wherein a portion of the first handle section is positioned inside of the second handle section, and wherein the second handle section includes at least one radially inward projection that engages an exterior region of the first handle section to substantially inhibit longitudinal movement of the first handle section relative to the second handle section.

13. The ball bat of claim **1** wherein the first handle section is connected to the second handle section via a threaded connector, and further comprising a bushing positioned between the first handle section and the threaded connector to facilitate relative rotation between the first and second handle sections.

14. The ball bat of claim **13** wherein the threaded connector includes at least one first opening, and the second handle section includes at least one second opening aligned with the at least one first opening, wherein a pin is positioned in the first and second openings to further secure the second handle section to the threaded connector.

15. A ball bat, comprising:

a first handle section extending in a longitudinal direction from a first end to a second end;

a second handle section extending in the longitudinal direction from a third end to a fourth end, with the third end of the second handle section in rotatable engagement with the second end of the first handle section such that the first and second handle sections are freely rotatable relative to each other to allow relative rotation between the first handle section and the second handle section during a swinging motion; and

a barrel attached to or integral with one of the first and second handle sections;

wherein the first handle section includes a threaded connector, and the second handle section includes a receiving element having internal threads that engage the threaded connector.

16. The ball bat of claim 15 further comprising at least one bearing positioned between the first and second handles sections to provide rotation between them.

17. A ball bat, comprising:

a first handle section having a first outer diameter;

a second handle section having a second outer diameter that is substantially equal to the first outer diameter, with the second handle section rotatably connected to the first handle section such that the first and second handle sections are freely rotatable relative to each other to allow relative rotation between the first handle section and the second handle section during a swinging motion;

a knob attached to or integral with the first handle section;

a barrel attached to or integral with the second handle section;

a first bearing member positioned in the knob; and

a second bearing member positioned between the first and second handle sections.

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